Robotic Platforms for Aerospace Research

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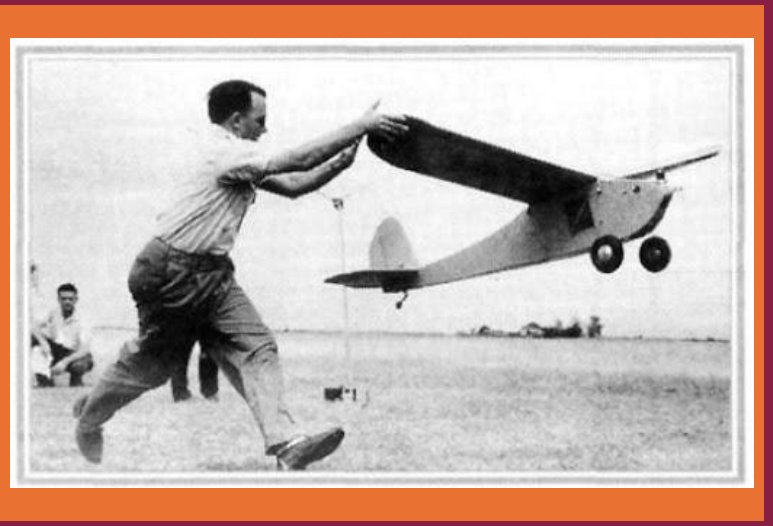
Historical Background



Early Remote Control Plane From 1947

3D Robotics Iris Drone Released in 2013

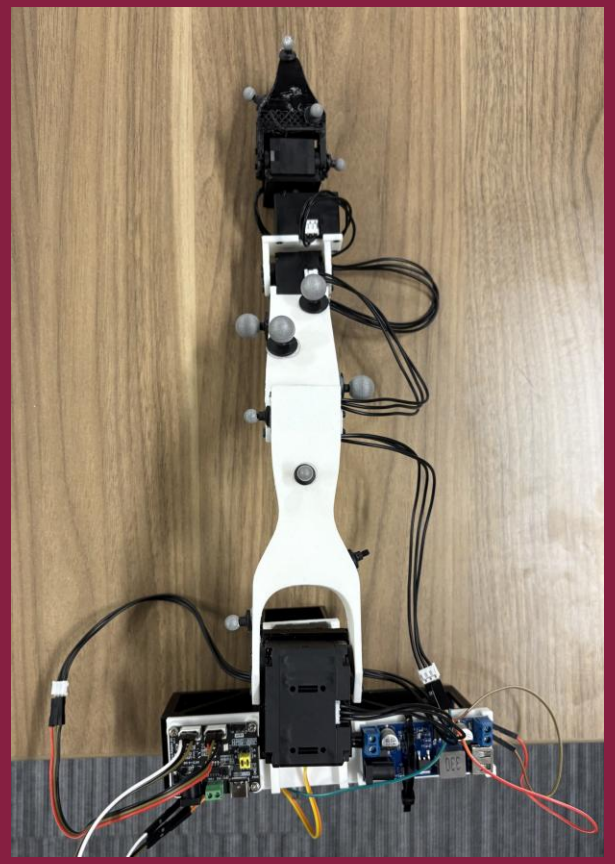
FAA Part-107 First Implemented In 2016

Amazon Delivery Drone

Zipline Platform-2 Drone

Robot Arms Assembly and Setup

Koch v1.1 Robot Arms



Follower Arm

Leader Arm

Hardware

3d printed predesigned parts

Followed video tutorial to assemble arms

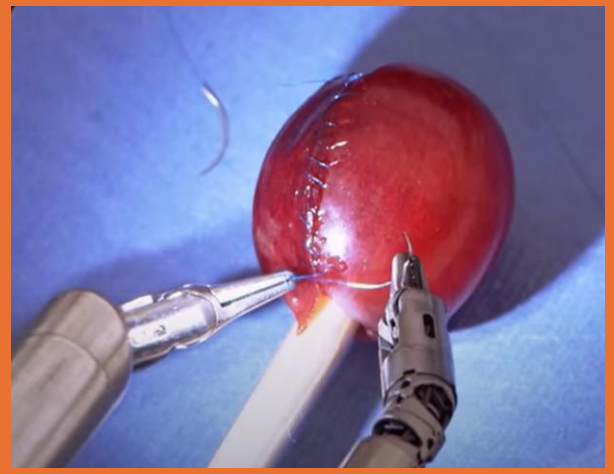
Software

Used open-source python scripts for:

- Motor configuration
- Motor calibration
- Arm Teleoperation

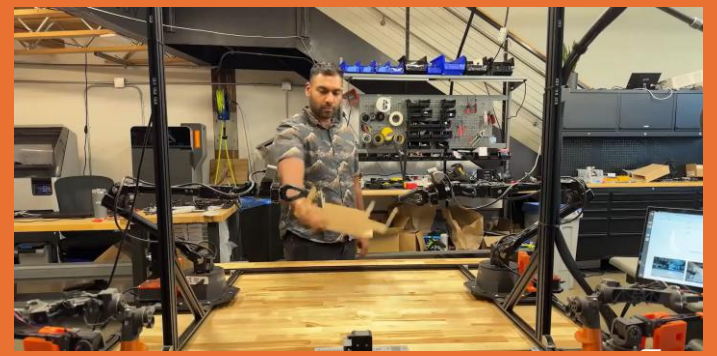
Robotic Systems Methods of Control

Teleoperation



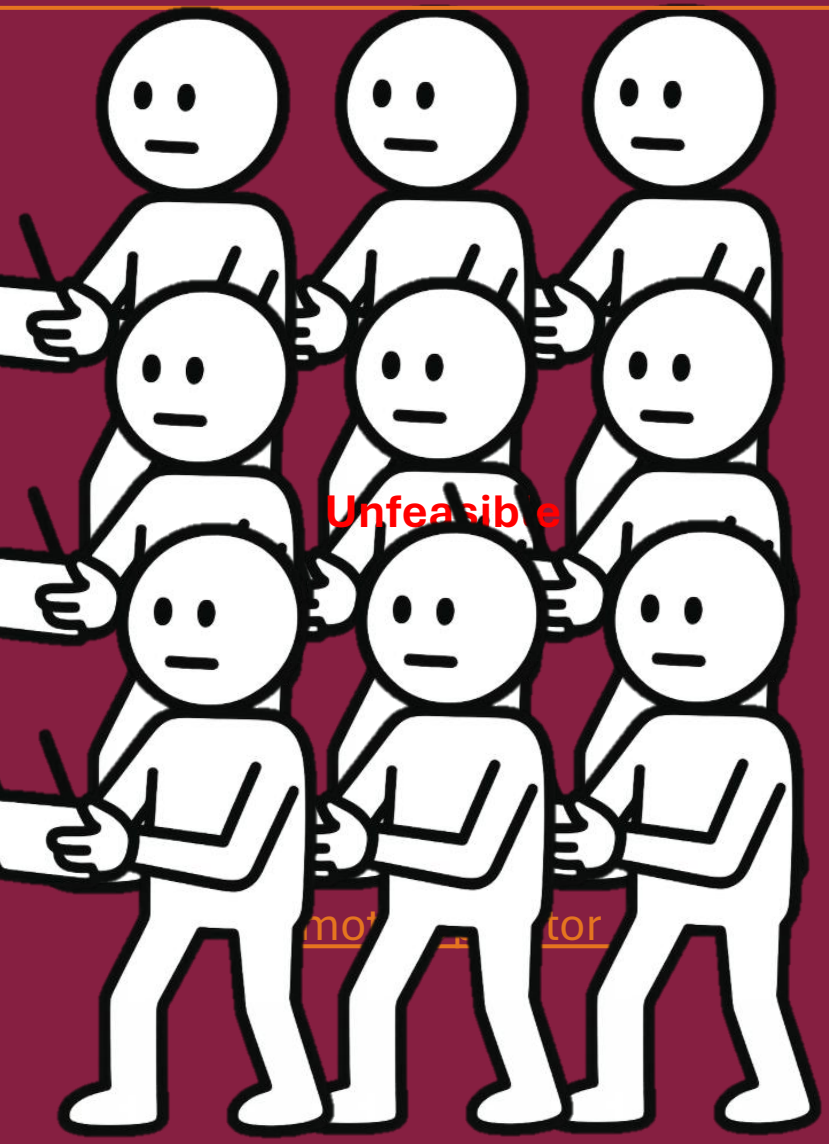
Hardcoding

Edge VLA Model



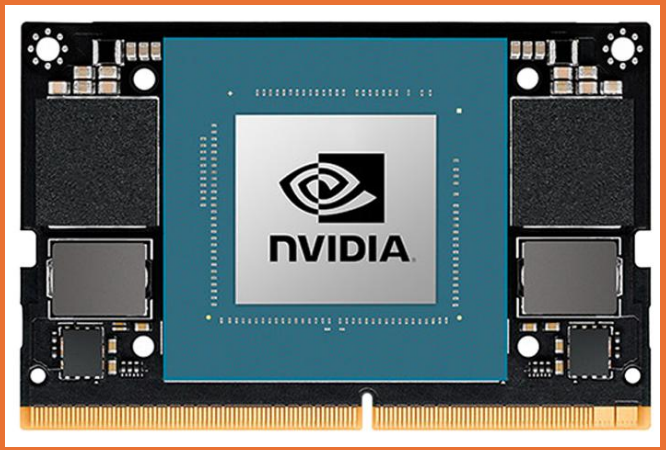
Fold the box

Drone Methods of Control



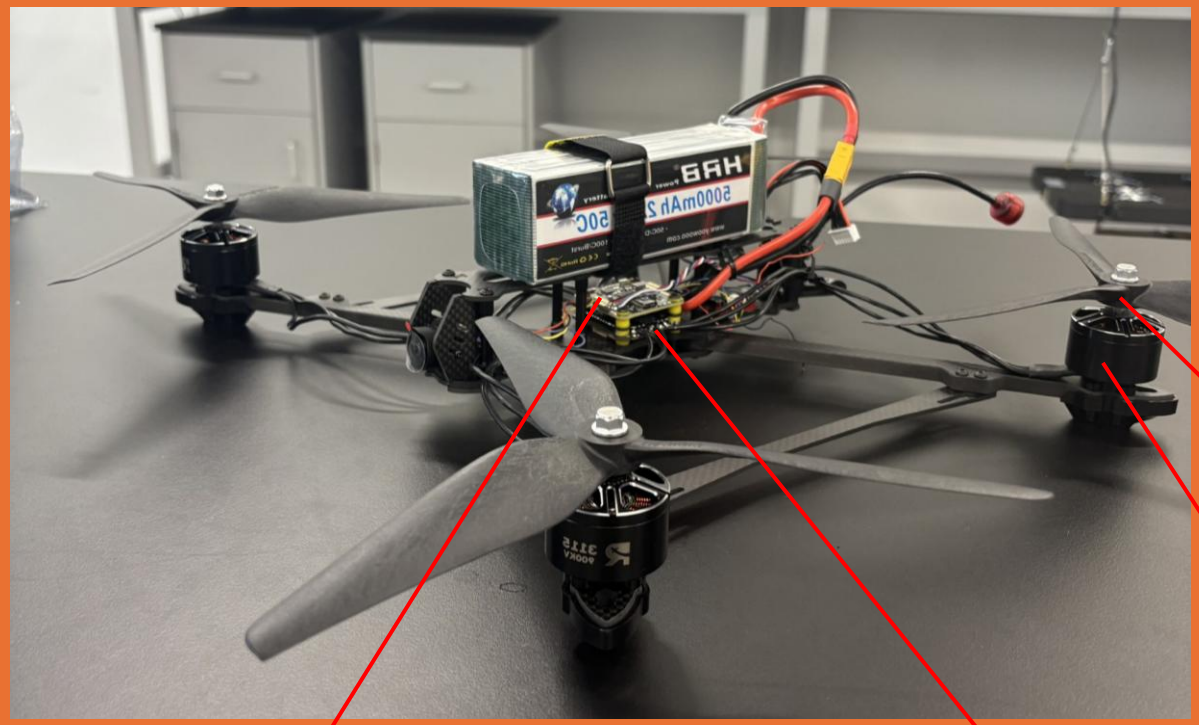
mot tor

Unexpected Situation

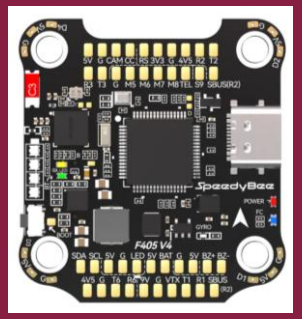


Edge VLMs

Drone Systems



Crazyflie 2.1 Brushless



SpeedyBee f405 v4 FC

Microcontroller-
STM32F405 MCU

Firmware-
BTFl 4.5.2

SpeedyBee BLS 55A 4in1 ESC

Microcontroller-
BB21 MCU

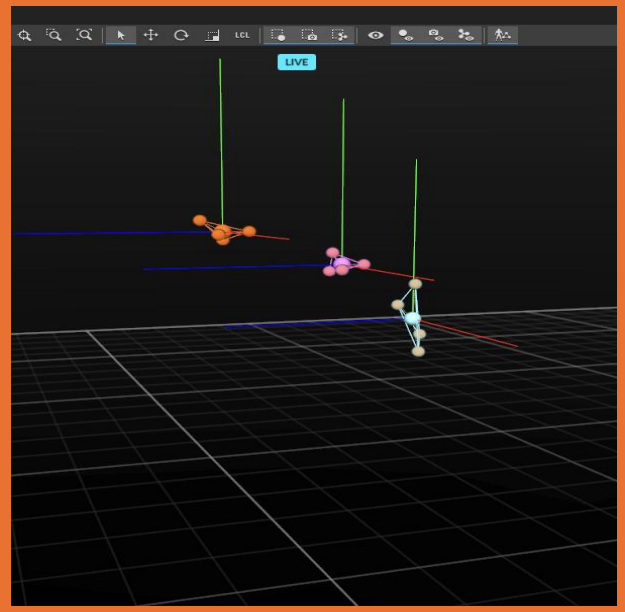
Firmware-
BLHeli_S J-H-40 16.7

10-Inch Drone Propellers

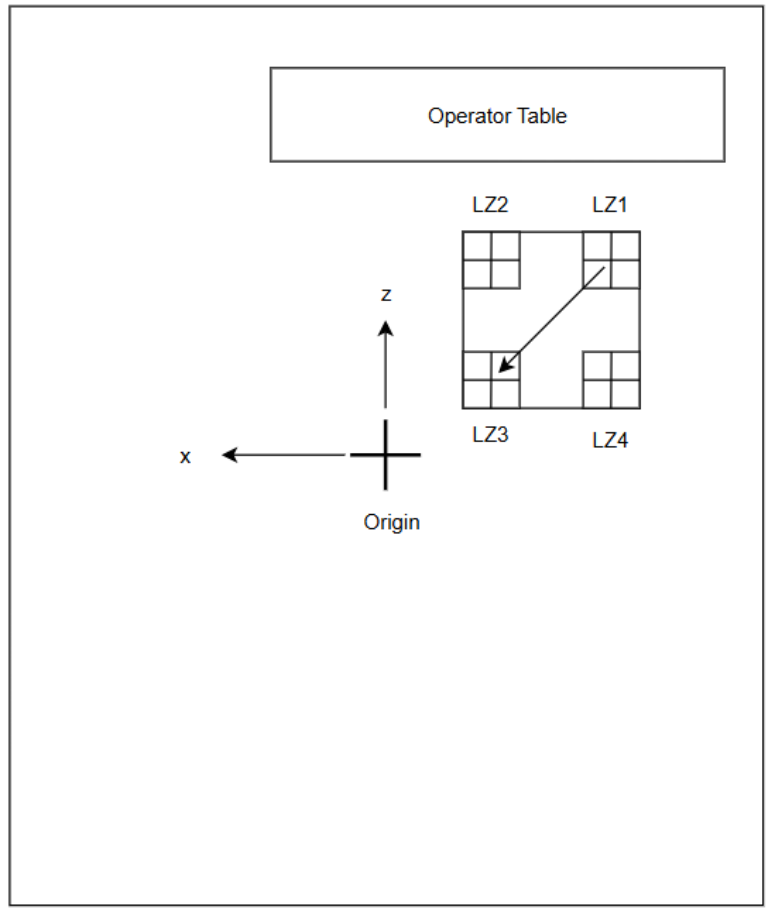
3115 900KV Motors

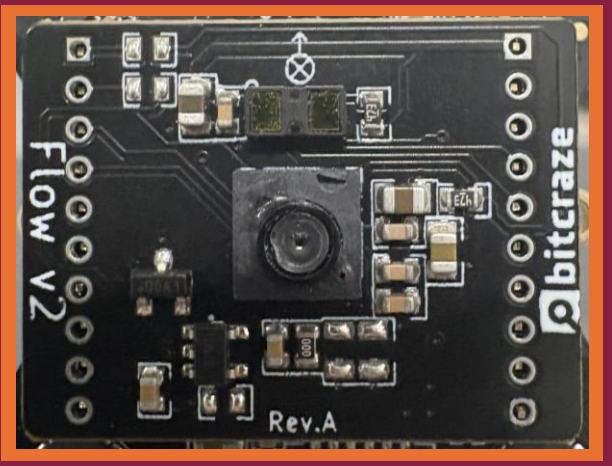
Stator height- 15mm
Stator Diameter- 31mm

Robot Arm Experimental Setup



Drone Experimental Setup





Crazyflie Flow Deck

Optitrack Motion Capture

10-Inch Drone Performance Results

Mass

Propellers | 26.38g Each | 105.52g Total

Motors | 103.57g Each | 414.28g Total

Battery | 719g

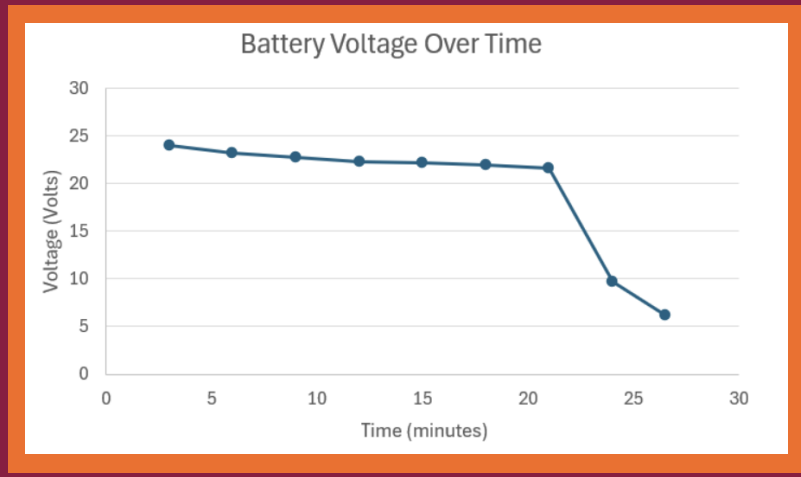
Drone Frame w/elect. | 402g

Total | 1.645kg

Jetson Orin Carrier Board | 80g

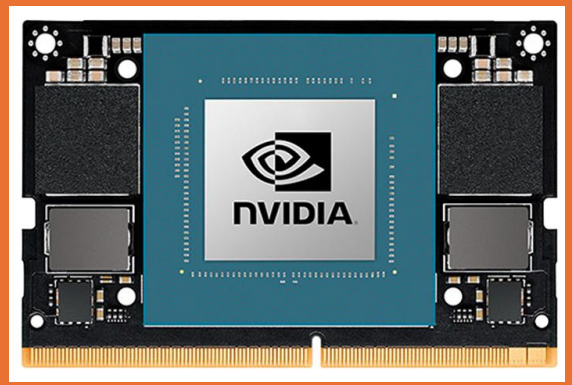
Jetson Orin NX- 28g

New Total | 1.748kg 6.26% Increase



Sudden drop between minute 21 and 24

Stopped spinning after around 26 minutes



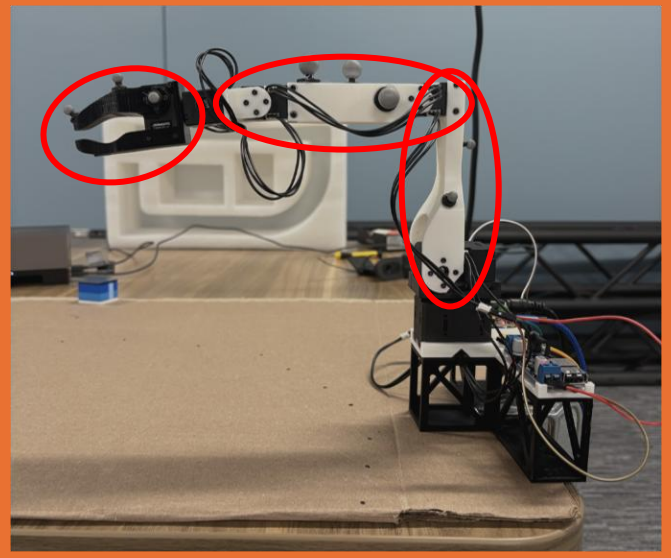
48 Meters

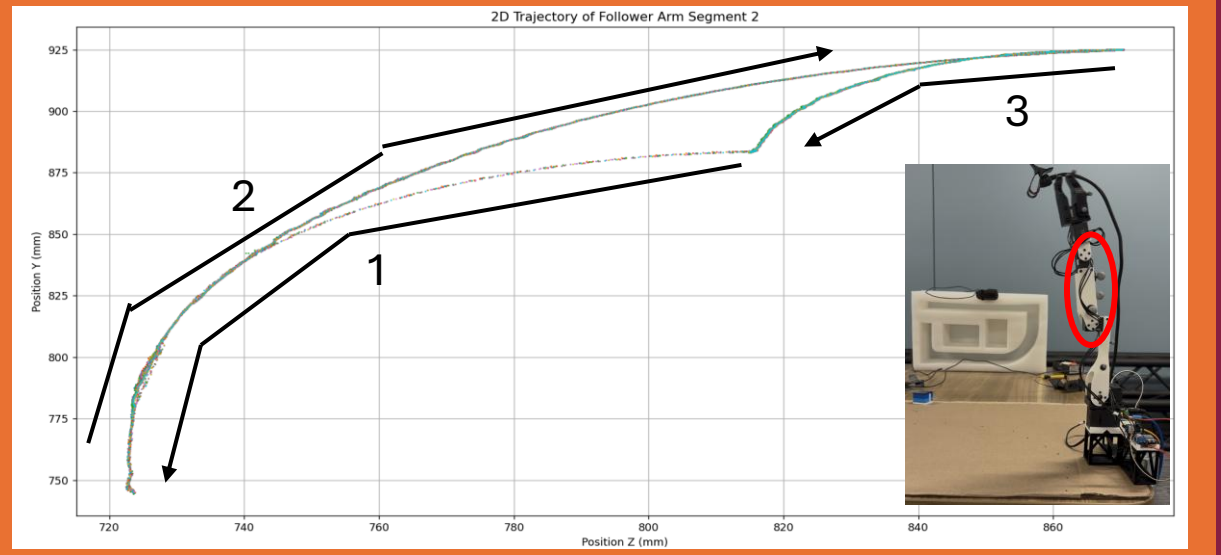
167 Meters

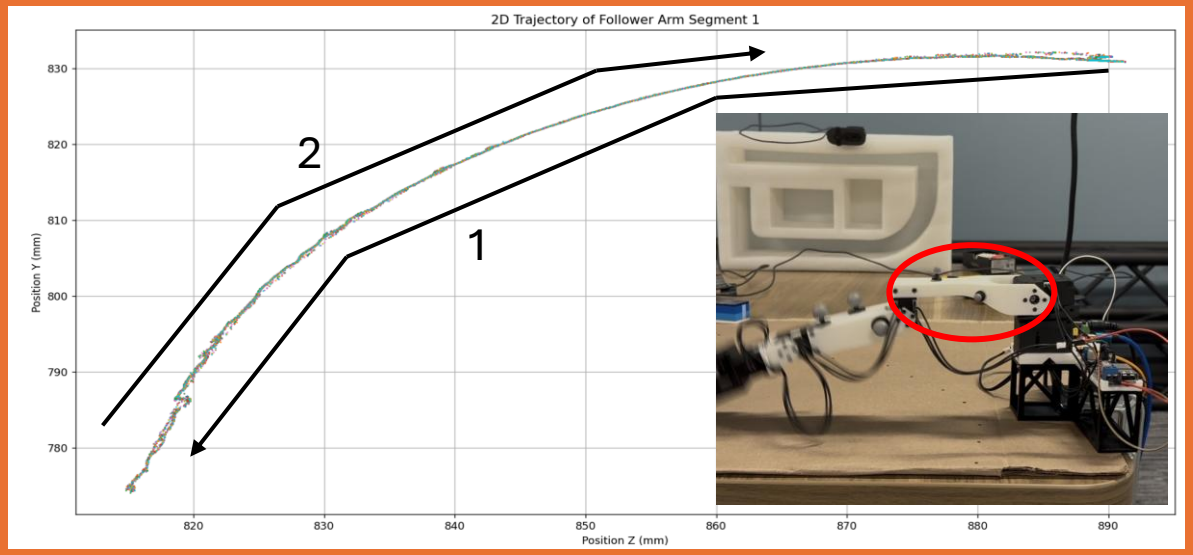
290 Meters

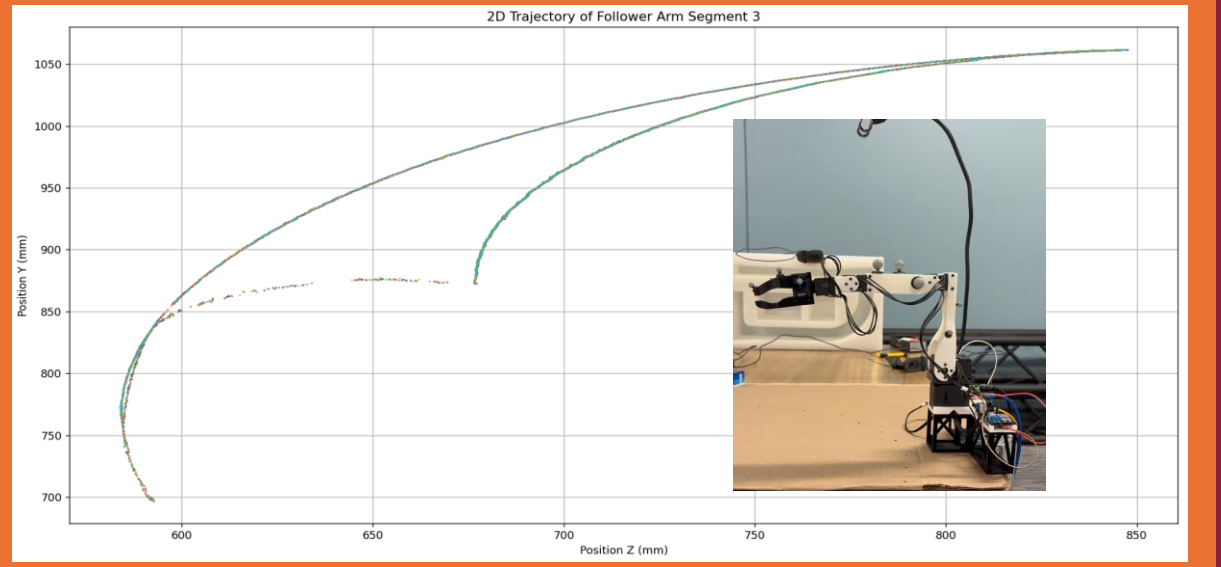
30 Runs With Robot Arm

Starting Position

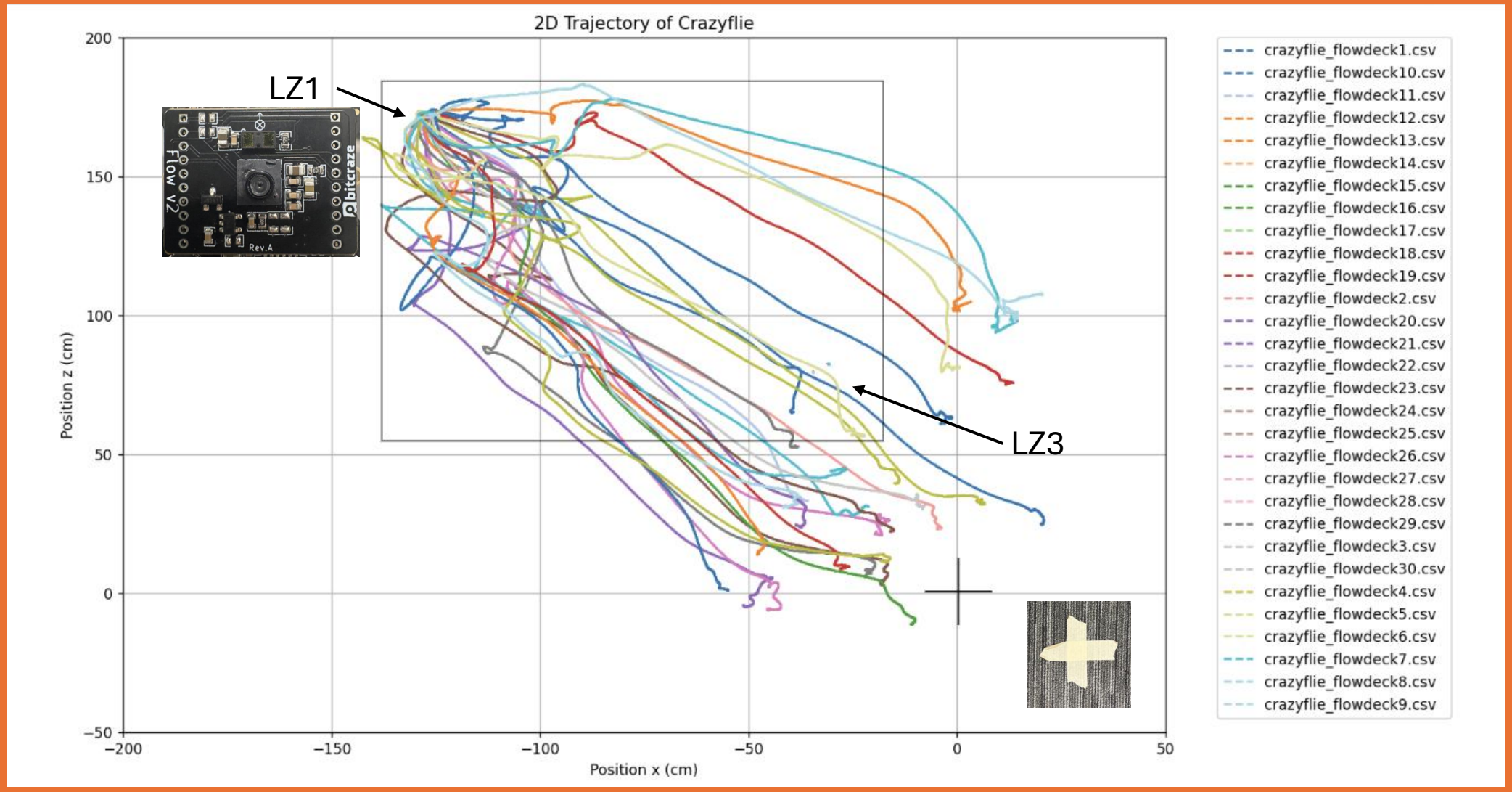




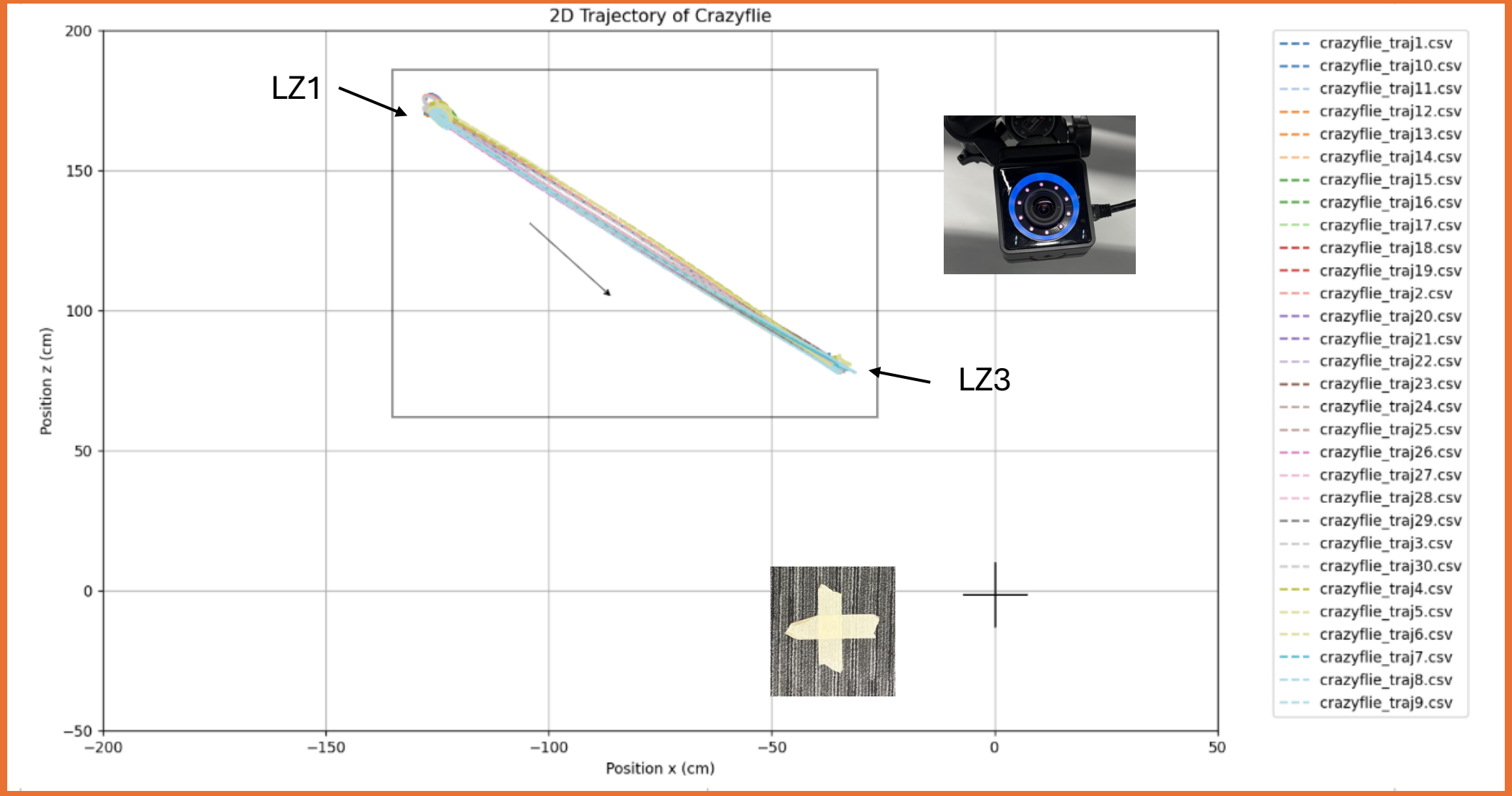




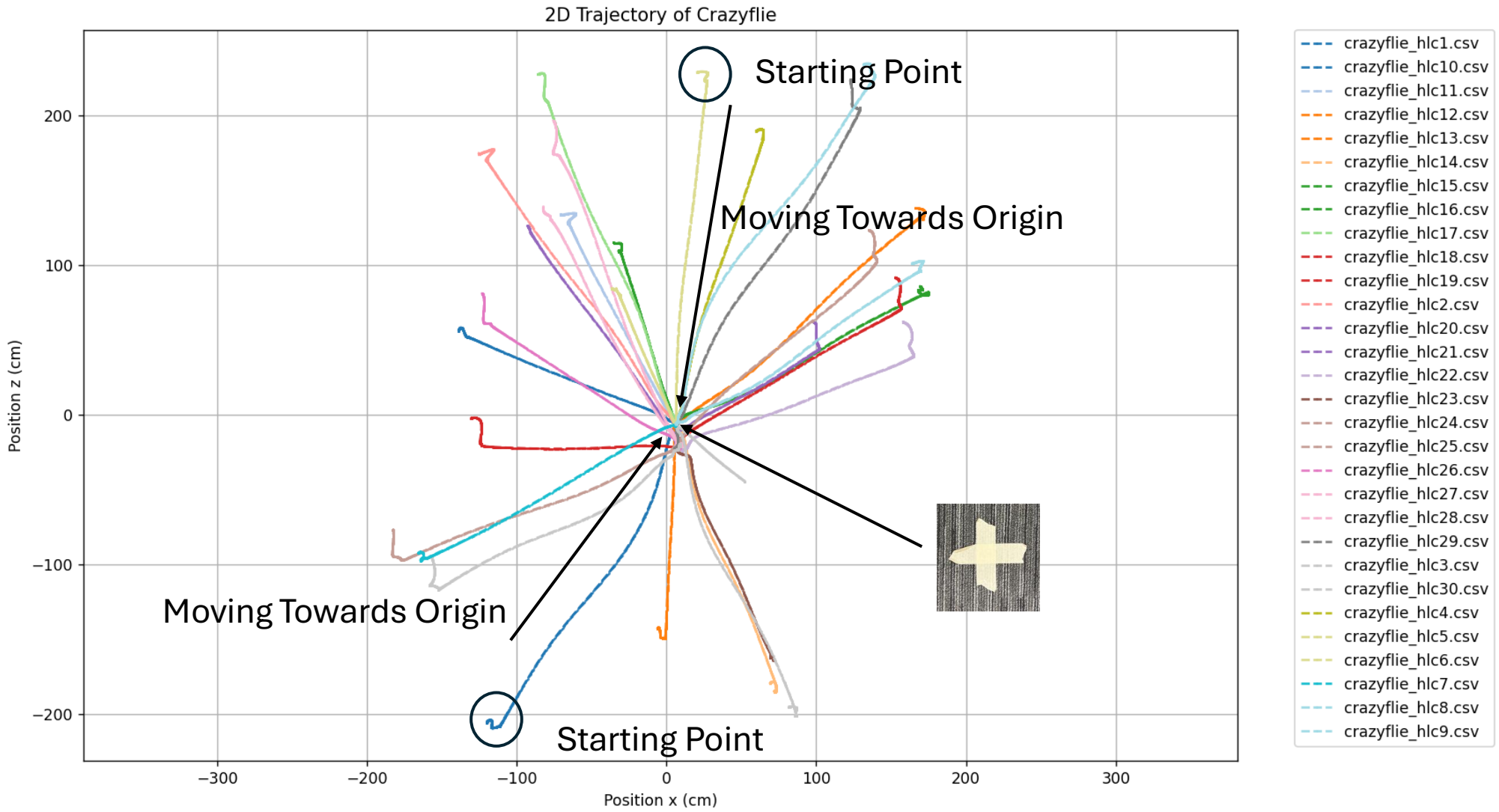
30 Runs with Flowdeck Result



30 Runs with Optitrack Result

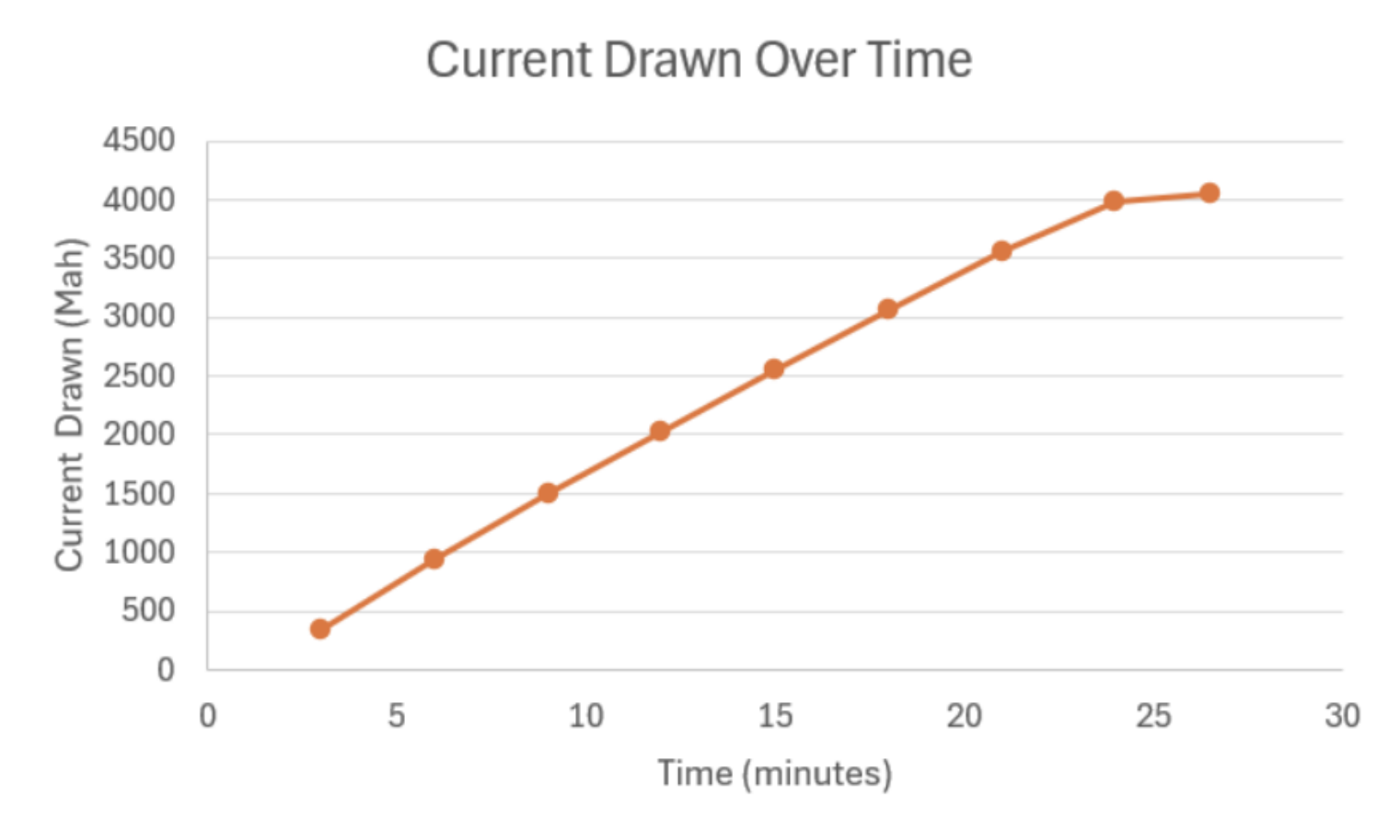


30 Runs with Optitrack Pt 2 Result

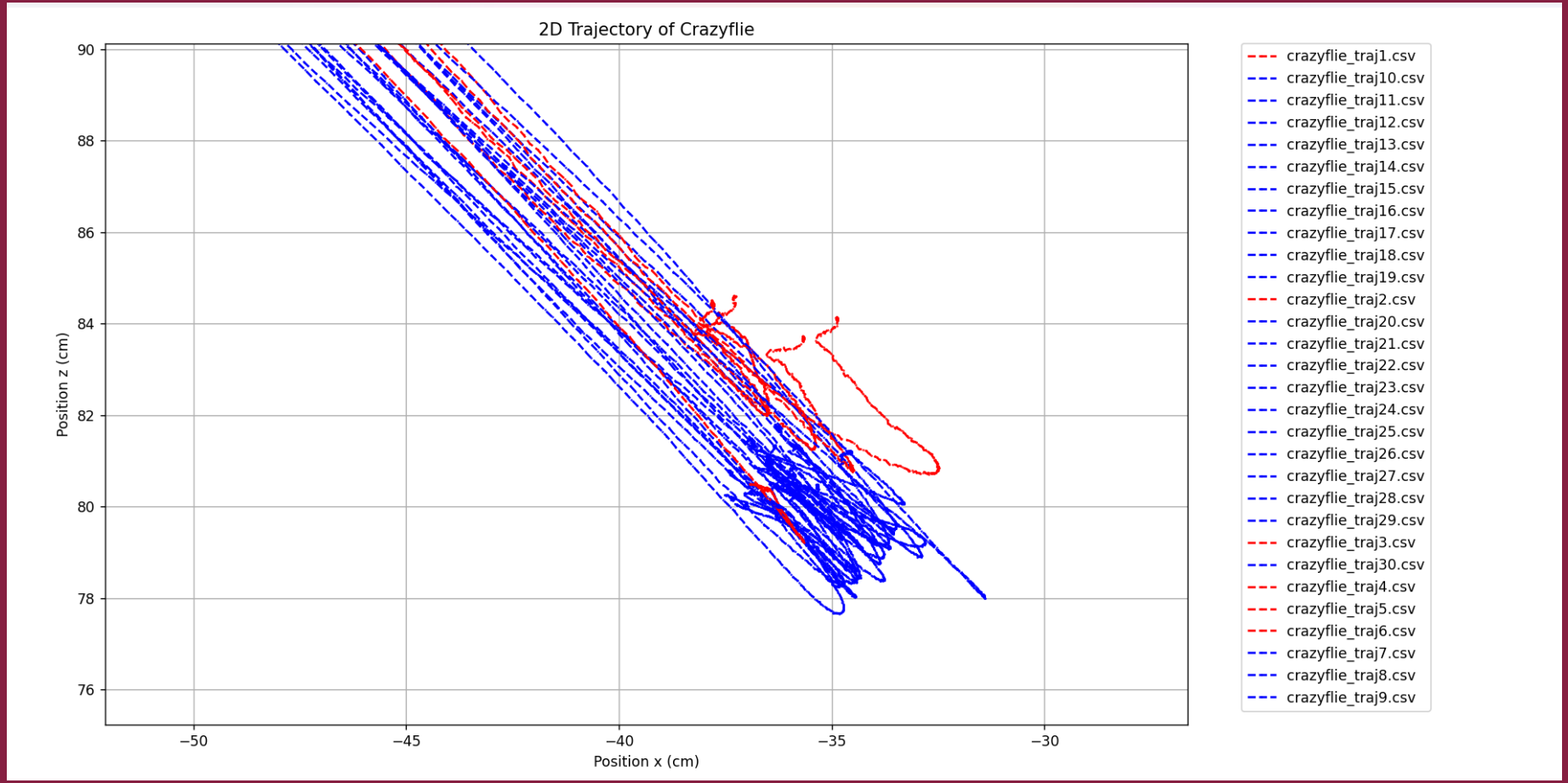


Questions?

Current Drawn Over Time (Mah)



Change in Path Due to Marker Placement



Zoomed in Segment of Arm Experiment